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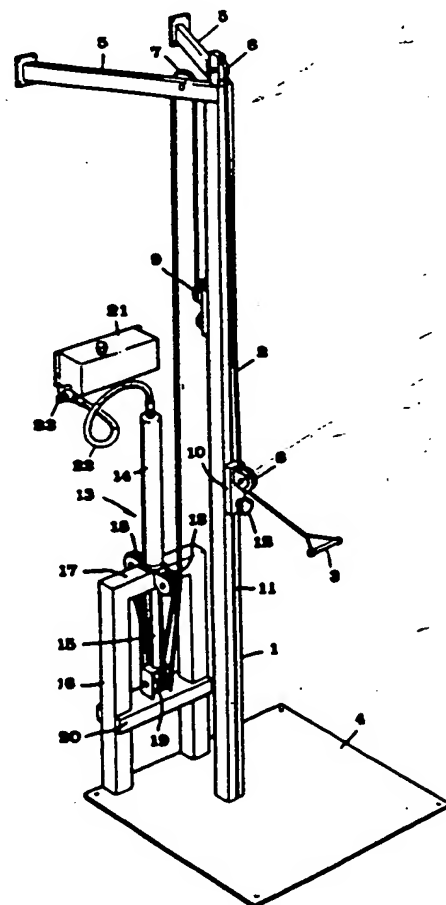
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(54) Title: APPARATUS FOR TRAINING MUSCLES

## (57) Abstract

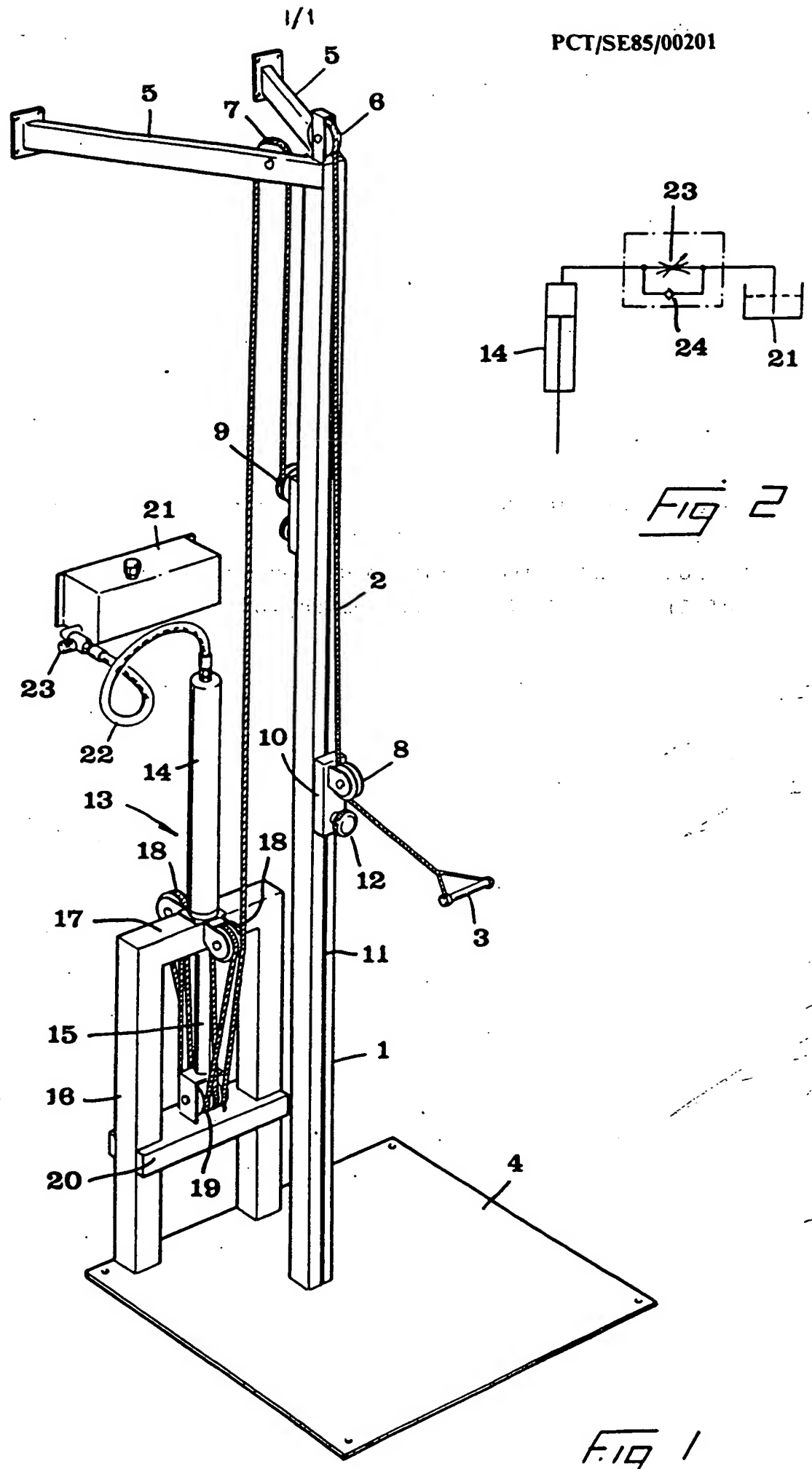
An apparatus for training muscles comprises a support-forming post (1) having at least two vertically spaced-apart pulley wheels (6, 8) a lower one (8) of which is adjustable and securable in varying positions of height along the post so as to locate a free end (3) of a pull rope (2) at a desired level, the pull rope being, at its end being opposite to the free end, connected to a counter-loading means (13) having the purpose to exert a counter force when the rope is pulled. This counter-loading means consists of a piston-cylinder mechanism (14, 15) being provided with a check valve (23) and operating with a pressure medium. In addition to this the pull rope (2) is connected to the piston-cylinder mechanism by way of a multiple pulley block means (18, 19) in order to obtain a large transmission ratio between on one hand the maximum distance that the free end of the rope can be pulled out and, on the other hand, the stroke of the piston rod (15) of said mechanism.



# INTERNATIONAL SEARCH REPORT

International Application No PCT/SE85/00201

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (If several classification symbols apply, indicate all) <sup>6</sup>		
According to International Patent Classification (IPC) or to both National Classification and IPC <sup>4</sup>		
A 63 B 21/00		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>7</sup>		
Classification System	Classification Symbols	
IPC 4	A 63 B 21/00, /06, /08, /10, /20 G 01 1:5/02	
US C1	272: 72, 93, 116-118, 125, 126, 130; 73: 379	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>8</sup>		
SE, NO, DK, FI classes as above		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT <sup>9</sup></b>		
Category <sup>10</sup>	Citation of Document, <sup>11</sup> with Indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
A	GB, A, 1 151 656 (HUNTER, W) 14 May 1969	
A	US, A, 3 387 843 (HANDLER L E) 11 June 1968	
<p><sup>10</sup> Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&amp;" document member of the same patent family</p>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
1985-12-16	1985-12-19	
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on repeated occasions the leg muscles in question are differently strong during each single motion depending on the instantaneous angle that the lower part of the leg has in relation to the femur. When the leg is stretched the power is accordingly considerably smaller than at e.g. an angle of  $60^\circ$  between the lower part of the leg and the femur. Since the counterweight always exerts an invariable counter force this means that the muscles during certain phases of an individual motion are loaded to a maximum, while they during other phases - when the power is increased - are loaded considerably less. A maximum loading of the muscles during the entire individual motion is therefore impossible to obtain in the apparatuses known.

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#### Brief description of the concept of invention

The present invention aims at setting aside the above mentioned disadvantages of the previously known training apparatuses of the type related in the preamble and creating an apparatus which is simple and easy to handle and gives a training result being optimal from the physiological point of view. According to the invention these and other aims are obtained by the fact that the counterloading means consists of a piston-cylinder mechanism being provided with a check valve and operating with a pressure medium and that the pull rope is connected to the piston-cylinder mechanism by way of a multiple pulley block means in order to obtain a large transmission ratio between on one hand the maximum distance that the free end of the rope can be pulled out and, on the other hand, the stroke of the piston rod of said mechanism.

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#### Brief description of the attached drawing

In the drawing Fig. 1 is a perspective view of the training apparatus according to the invention and Fig. 2 a diagram illustrating the function of the piston-cylinder mechanism.

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APPARATUS FOR TRAINING MUSCLESThe technical field of the invention

This invention refers to a muscles training apparatus of the type comprising a support-forming post having at least two vertically spaced-apart pulley wheels, a lower one of which is adjustable and securable in varying positions of height along the post so as to locate a free end of a pull rope or the like extending between said pulley wheels at a level desired by a training person, said rope being, at its end being opposite to the free end, connected to a counter-loading means having the purpose to exert a counter-force when the rope is pulled.

Background of the invention

Training apparatuses of the above mentioned type are advantageous insofar as they are comparatively cheap to manufacture and all-round in respect of their fields of application since they can, by a simple adjustment of the adjustable pulley wheel, be used by persons having most differing statures and for training several different parts of the body, such as arms and legs. The conventional training apparatuses of this type are, however, also associated with a plurality of disadvantages being founded on the fact that counter-weights are used as counter-loading means, i.e. bodies exerting the necessary counter-force by their deadweight. When the apparatus is used by different persons and when one and the same person shall use the apparatus for various training actions respectively it is necessary to change the number of counter weights; a work which is troublesome and takes considerable time to carry out. Another disadvantage being maybe more serious is that such counterweights give a less favourable training result from a physiological point of view in as much as the muscles of the training person will be differently loaded during one and the same motion. If a person is going to train for instance a leg by pulling the pull rope of the apparatus therewith

Detailed description of a preferred embodiment of the invention

In the drawing 1 generally designates a support in the form of a long post, while 2 designates a pull rope having a free end which advantageously may have a handle 3. The post 1 is attached to a bottom plate 4 being fixable to a floor and has at its upper part two bracket-shaped arms 5,5' which may be attached to a wall. Four pulley wheels or means are associated with the post 1, namely two stationary pulley wheels 6,7 mounted in the area of the upper part of the post and two movable pulley wheels 8,9 arranged at opposite sides of the post 1. More precisely the two movable pulley wheels are each arranged on a sled-like element 10 which is displaceable along a guide-forming groove 11 and has a locking mechanism 12 by means of which the same can be locked in arbitrarily positions along the post. The pull rope 2 extends from the first adjustable pulley wheel 8 to the second adjustable pulley wheel 9 by way of the first stationary wheel 6 and further to a counter-loading means, designated 13 in its entirety, by way of the second stationary pulley wheel 7. By the fact that the pull rope in this manner runs over two pulley wheels being vertically adjustable it is guaranteed that the free end of the pull rope in its initial position extends out from the post an equally long distance irrespectively of whether the first adjustable pulley wheel is located high or low, because if the first adjustable pulley wheel 8 is lowered then the second adjustable pulley wheel 9 can be raised and vice versa.

As far as the apparatus is hitherto described the same is per se previously known.

As a main component in the counter loading means for the pull rope 2 a piston-cylinder mechanism, the cylinder of which is designated 14 and the piston-rod of which is designated 15, is included according to the

principle of the invention, said mechanism preferably operating with a hydraulic pressure medium. In the example shown the cylinder 14 is mounted on a U-shaped frame 16 the two shanks of which are stationary affixed, preferably on the bottom plate 4. More precisely the cylinder 14 is turned upside down so that the piston rod 15 projects vertically down from the overhead part 17 of the frame 16.

10 In order to create a great transmission ratio, suitably 4:1 á 6:1 between on one hand the maximum distance which the handle 3 of the pull rope 2 can be pulled out and on the other hand the stroke of the piston rod 15, the rope 2 is connected to the piston-cylinder  
15 mechanism by way of a multiple pulley block means which comprises a number of stationary blocks 18 attached to the overhead part 17 as well as a number of movable blocks 19 attached to a cross piece 20 which is movable along the shanks of the frame 16, said shanks serving as guides.  
20 In practice the handle 3 should be capable of being pulled out 2 to 3 metres from its initial position when using a piston-cylinder mechanism the piston rod of which has a stroke of 0.5 metre.

25 In the example shown the piston-cylinder mechanism is of the single-acting type having a separate tank 21 mounted above the cylinder, e.g on the wall in question. The cylinder 14 is connected to the tank 21 through a conduit 22 in which a check valve 23 as well as a non-  
30 return valve 24 are arranged, said nonreturn valve making a pressure medium flow from the cylinder to the tank impossible, but allowing a free flow in the reversed direction. By means of the check valve 23 it is extremely simple to adjust the resistance that the pressure medium  
35 exerts when the piston is moved upwardly through the cylinder.

Advantageously the cross piece 20 has a considerable weight so as to automatically return the piston rod 15 to an initial position pulled out of the cylinder as soon as the tractive force in the rope 2 ceases.

- 5 Possibly the cross piece can be completed with one or more springs for providing the same function.

The function and advantages of the apparatus according to the invention

- 10 When the two pulley wheels 8,9 have been adjusted so that a suitable level is obtained for the free end of the pull rope 2 and when the check valve 23 has been adjusted into a desired position for the person in question and the training action respectively, training starts by  
15 the fact that the person in question pulls the handle 3. This pulling is by way of the pulley block means 18,19 transformed into a movement of the piston rod 15 inwardly in the cylinder 14, the pressure medium therein exerting the necessary resistance against the tractive force  
20 in the rope. This resistance is not constant but will vary in dependence of the variations of the tractive force in the rope, meaning that the muscles in the part of the body being trained will be equably and maximally loaded during the entire path of motion of the bodypart  
25 in question. In other words the training action will get an isokinetic character, which is extremely advantageous in physiological respect.

Conceivable modifications of the invention

- 30 Of course the invention is not limited merely to the embodiment described and shown in the drawing. Thus it is conceivable to arrange the piston-cylinder mechanism in another manner than the one shown in the drawing. Further it is conceivable to use air or gas as a pressure medium  
35 in the piston-cylinder mechanism instead of hydraulic oil.



CLAIMS

1. Apparatus for training muscles, comprising a support-forming post(1) having at least two vertically spaced-apart pulley wheels(6,8), a lower one(8) of which  
5 is adjustable and securable in varying positions of height along the post so as to locate a free end(3) of a pull rope or the like(2), extending between said pulley wheels, on a level desired by a training person, said pull rope being, at its end being opposite to the free end, connected to a counter-loading means having the purpose of  
10 exerting a counter force when the rope is pulled, characterized in that the counter-loading means consists of a piston-cylinder mechanism(14,15) being provided with a check valve(23) and operating with  
15 a hydraulic pressure medium and that the pull rope(2) is connected to the piston-cylinder mechanism(14,15) by way of a multiple pulley block means(18,19) in order to obtain a large transmission ratio between on one hand the maximum distance that the free end of the rope can  
20 be pulled out and on the other hand the stroke of the piston rod(15) of said mechanism.

2. Apparatus according to claim 1, characterized in that the cylinder(14) of  
25 the piston-cylinder mechanism is stationary attached to a suitably U-shaped frame(16) along which a crosspiece (20) is movable to which the piston rod(15) of the mechanism is connected, a number of blocks(18) included in said pulley block means being arranged on the frame at the same  
30 time as a number of blocks(19) are arranged on the movable cross piece(20).

3. Apparatus according to claim 2, characterized in that the frame(16) as well  
35 as the piston-cylinder mechanism(14,15) are vertically oriented and that said mechanism is of the single-acting type and connected to a tank(21) placed at a level above the cylinder, the cross piece having a considerable weight

so as to automatically return the piston rod to a position pulled out of the cylinder as soon as the tractive force in the rope ceases and in connection herewith return hydraulic liquid pumped out from the tank(21) to the cylinder(14).

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